US010452747B2

(12) **United States Patent**
**He et al.**

(10) **Patent No.: US 10,452,747 B2**
(45) **Date of Patent: Oct. 22, 2019**

# (54) DYNAMICALLY FORMATTING SCALABLE VECTOR GRAPHICS

(71) Applicant: **Microsoft Technology Licensing, LLC.**, Redmond, WA (US)

(72) Inventors: **Haitao He**, Redmond, WA (US); **Stephanie Lorraine Horn**, Bellevue, WA (US); **Thomas Roland Mignone**, Seattle, WA (US); **Matthew William Kernek**, Seattle, WA (US); **Ancuta Irina Zaharia**, Sammamish, WA (US)

(73) Assignee: **MICROSOFT TECHNOLOGY LICENSING, LLC**, Redmond, WA (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 324 days.

(21) Appl. No.: **15/247,643**

(22) Filed: **Aug. 25, 2016**

(65) **Prior Publication Data**

US 2017/0293592 A1 Oct. 12, 2017

**Related U.S. Application Data**

(60) Provisional application No. 62/320,989, filed on Apr. 11, 2016.

(51) **Int. Cl.**

| | |
|---|---|
| ***G06F 17/21*** | (2006.01) |
| ***G06F 17/22*** | (2006.01) |
| ***G06F 3/0482*** | (2013.01) |

(52) **U.S. Cl.**
CPC .......... ***G06F 17/211*** (2013.01); ***G06F 3/0482*** (2013.01); ***G06F 17/212*** (2013.01); (Continued)

(58) **Field of Classification Search**
None
See application file for complete search history.

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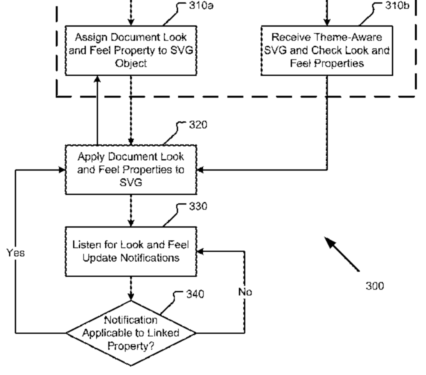
*Primary Examiner* — Howard Cortes
(74) *Attorney, Agent, or Firm* — Merchant & Gould

## (57) ABSTRACT

The Scalable Vector Graphics (SVG) standard defines a way to describe two-dimensional graphics within the extensible markup language (XML) that can be interpreted by multiple programs. The SVG standard, however, lacks native support for several user experience features, such as look and feel settings (e.g., themes) that affect multiple objects within a document. The present disclosure, however, teaches how an SVG object may be made theme-aware and still comply with the SVG standard so that it is portable between files and applications that apply the present disclosure and those that do not. By enabling the dynamic updating of SVG objects, the benefits to the user experience and computer efficiency associated with standardized vector graphics and the document-wide application of look and feel settings can be realized without deviating from the SVG standard.

**19 Claims, 12 Drawing Sheets**


START
310
310a
310b
Assign Document Look and Feel Property to SVG Object
Receive Theme-Aware SVG and Check Look and Feel Properties
320
Apply Document Look and Feel Properties to SVG
330
Listen for Look and Feel Update Notifications
340
Notification Applicable to Linked Property?
Yes
No
300

(52) **U.S. Cl.**
CPC .......... ***G06F 17/218*** (2013.01); ***G06F 17/227*** (2013.01); ***G06F 17/2235*** (2013.01); ***G06F 17/2247*** (2013.01)

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Guy, Emma, "Dynamically changing SVG colours on Android", Published on: Nov. 29, 2015 Available at: https://medium.com/@emmaguy/dynamically-changing-svg-colours-on-android-b026a99137ad#.m0z0qc7ey.

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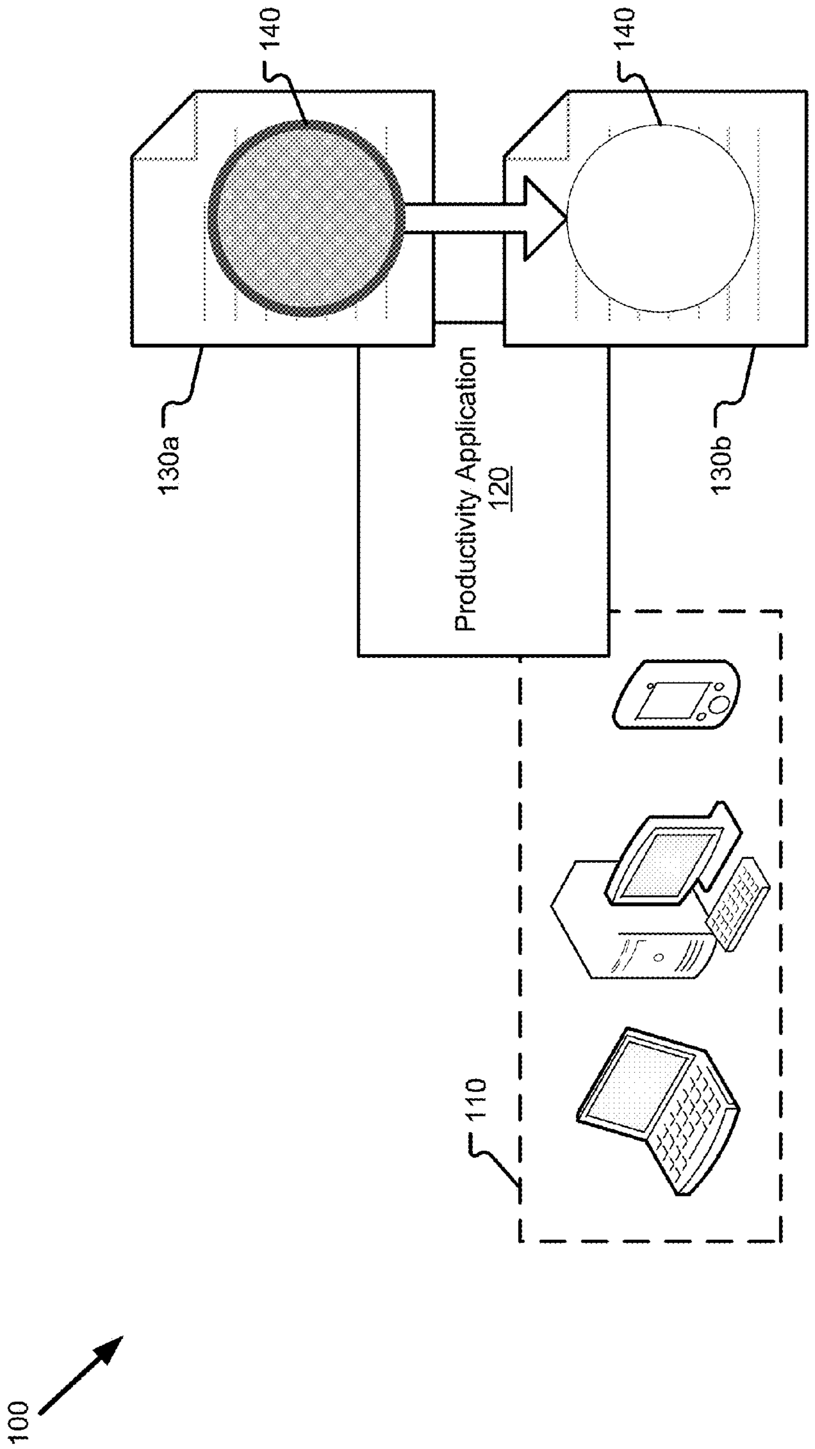


FIG. 1A

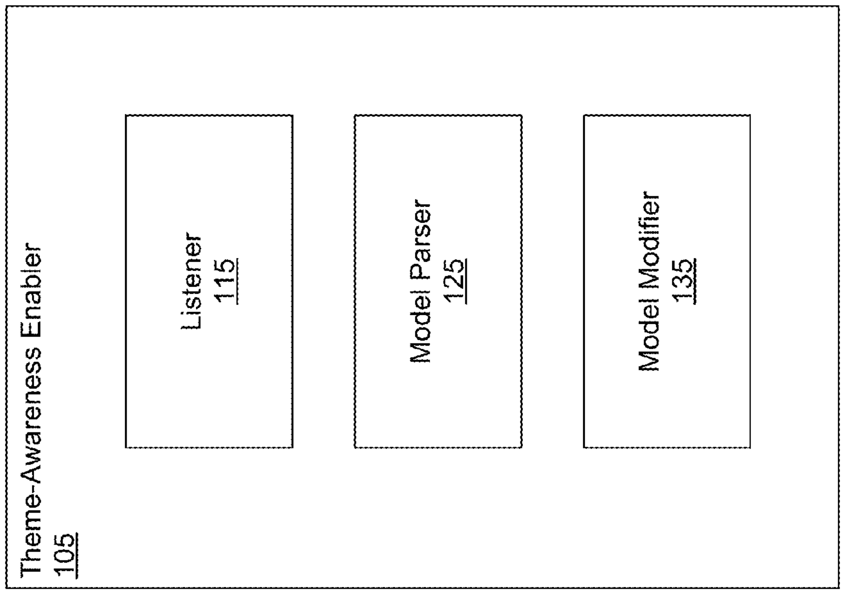

Theme-Awareness Enabler
105
Listener
115
Model Parser
125
Model Modifier
135

FIG. 1B

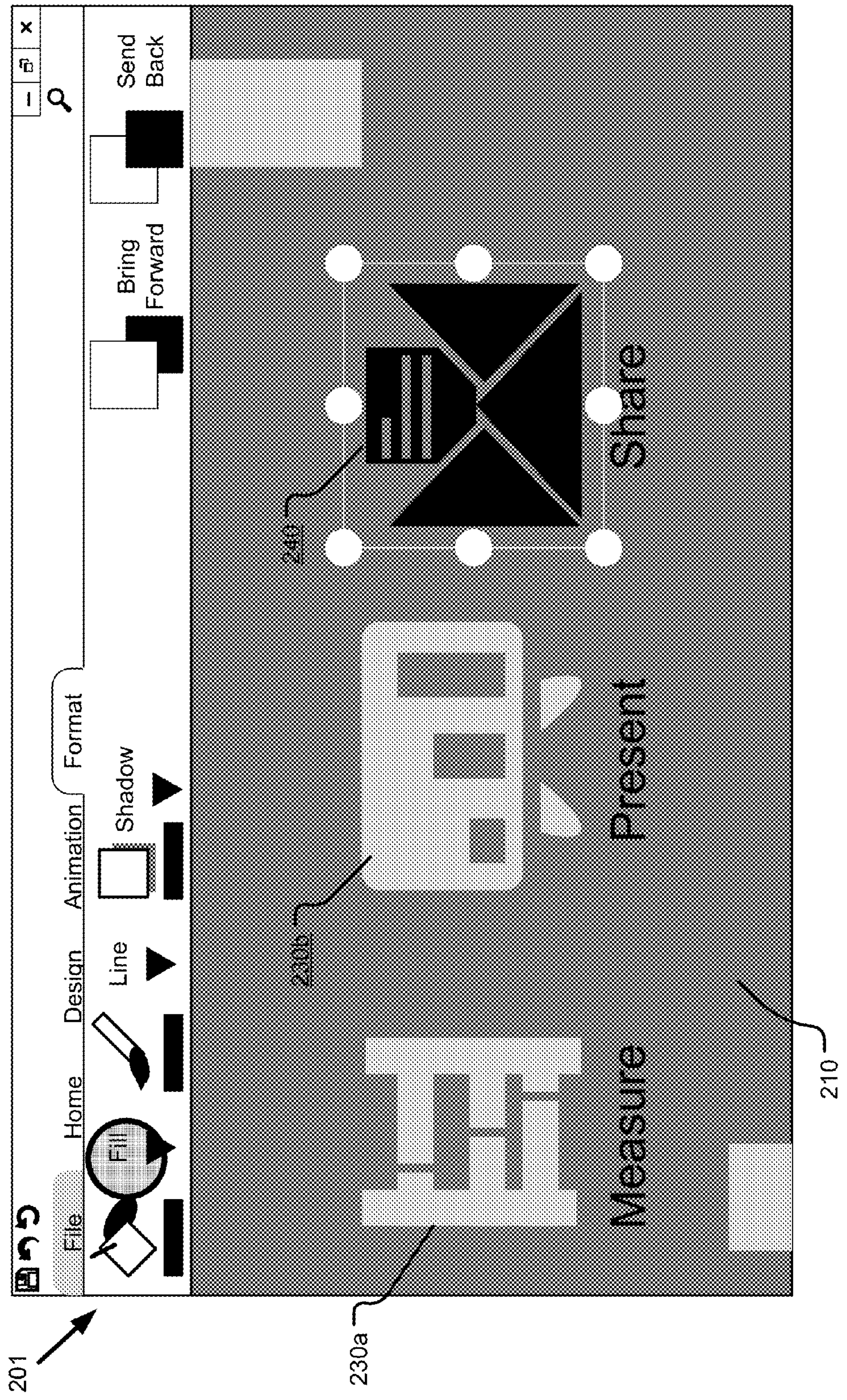

201
File
Home
Design
Animation
Format
Fill
Line
Shadow
Bring Forward
Send Back
Measure
Present
Share
230a
230b
240
210

FIG. 2A

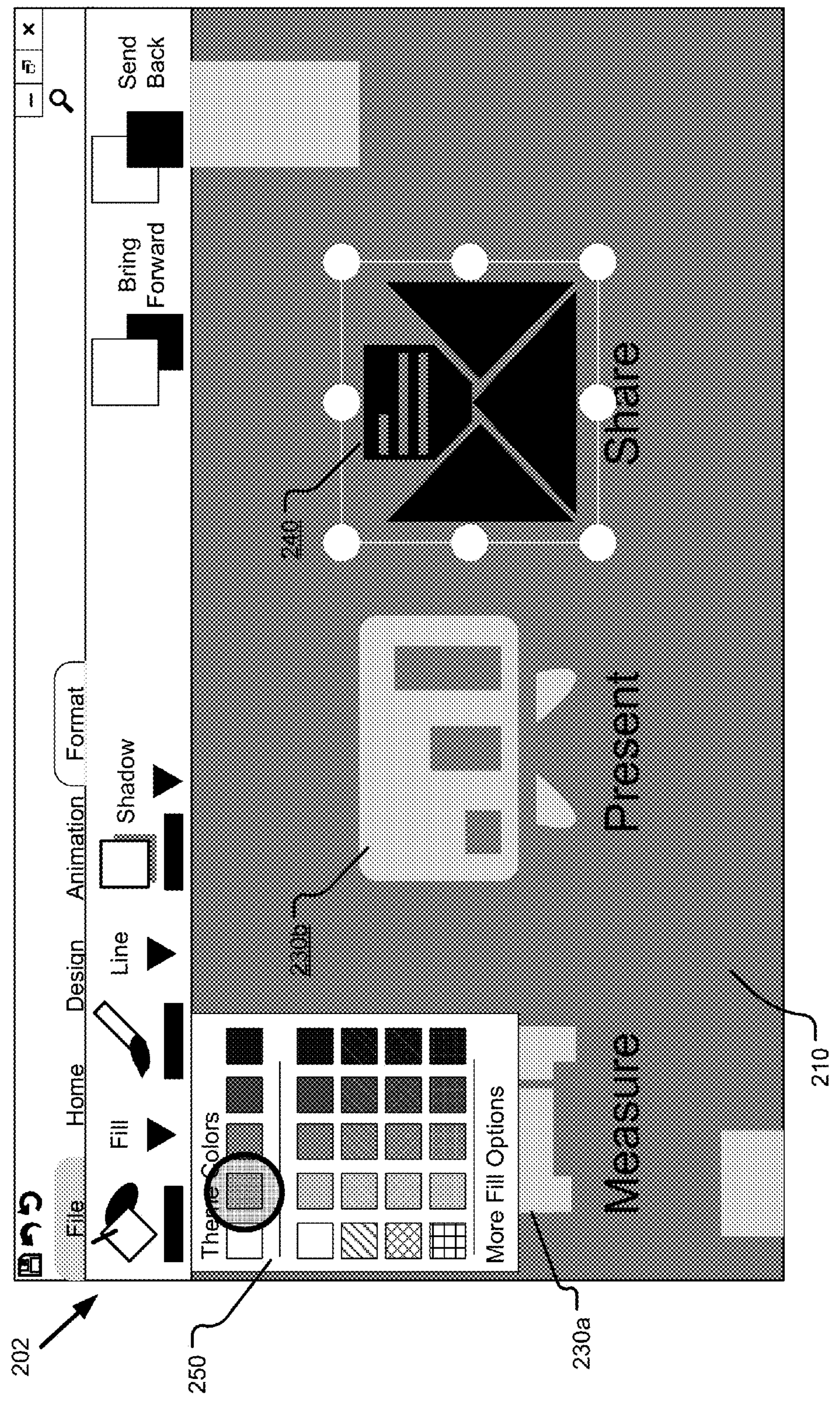

202
File
Home
Design
Animation
Format
Fill
Line
Shadow
Bring Forward
Send Back
Theme Colors
More Fill Options
250
230a
230b
240
210
Measure
Present
Share

FIG. 2B

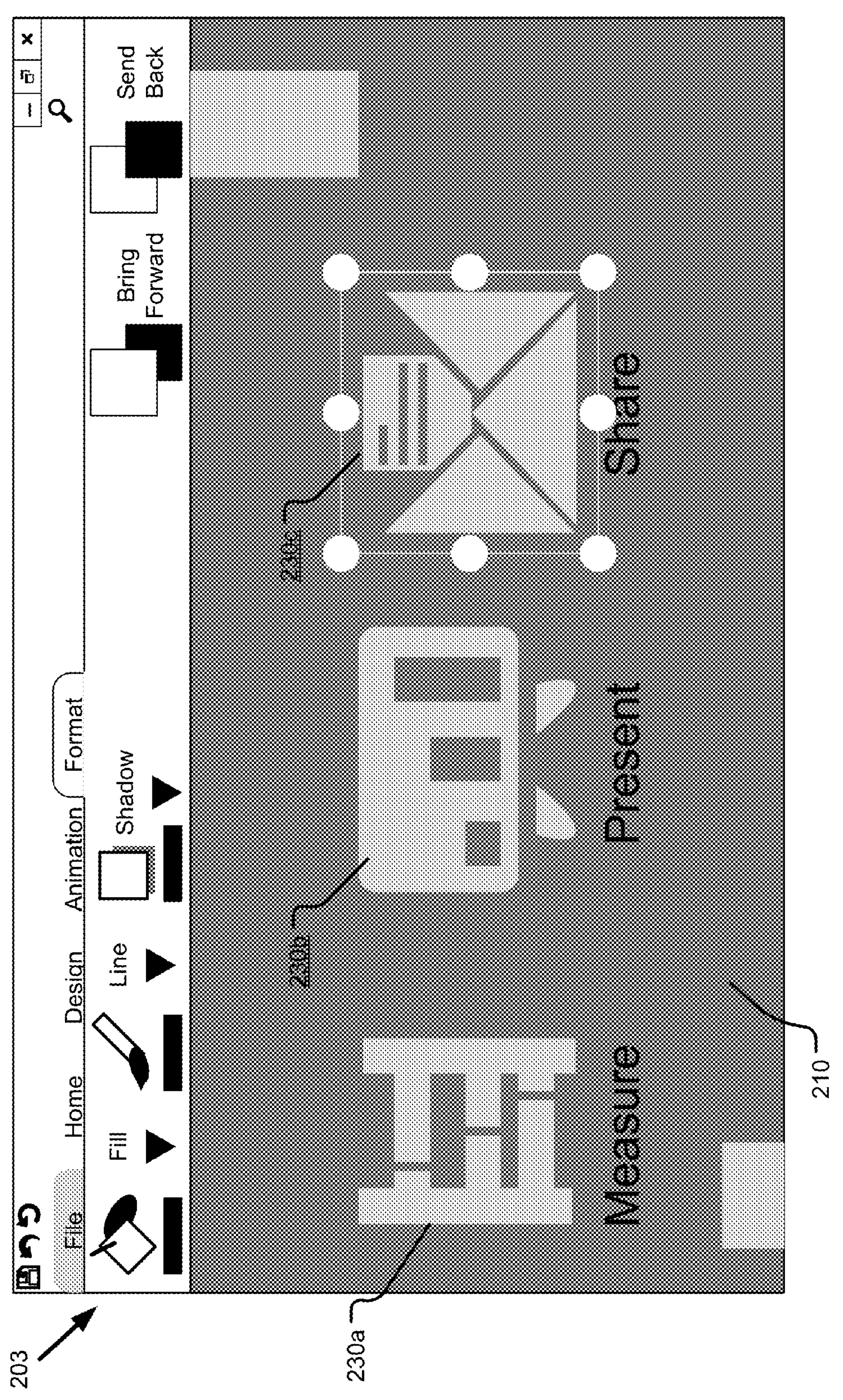

203
File
Home
Design
Animation
Format
Fill
Line
Shadow
Bring Forward
Send Back
Measure
Present
Share
230a
230b
230c
210

FIG. 2C

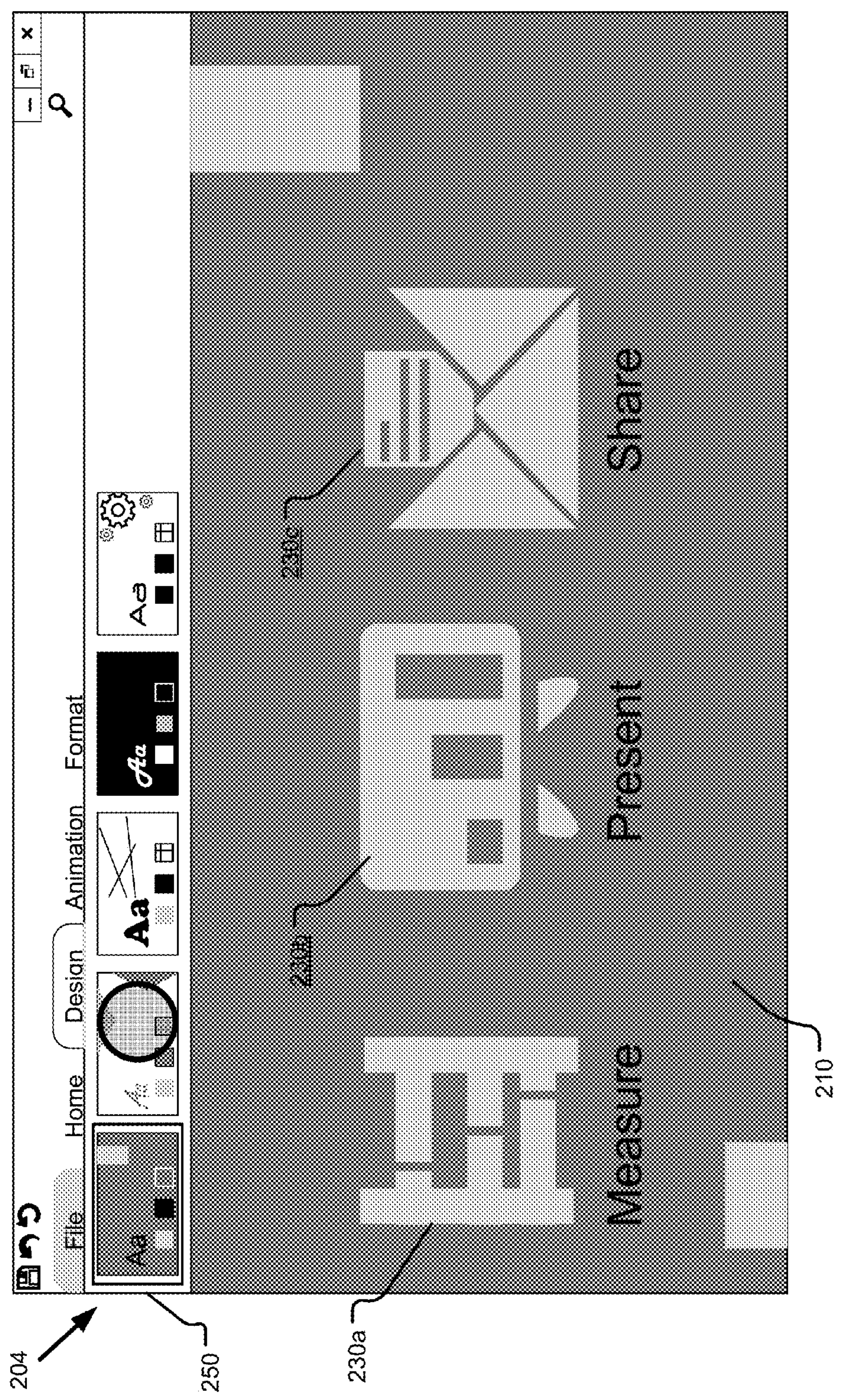

File
Home
Design
Animation
Format
Aa
Aa
Aa
Aa
Measure
Present
Share
204
250
230a
230b
230c
210

FIG. 2D

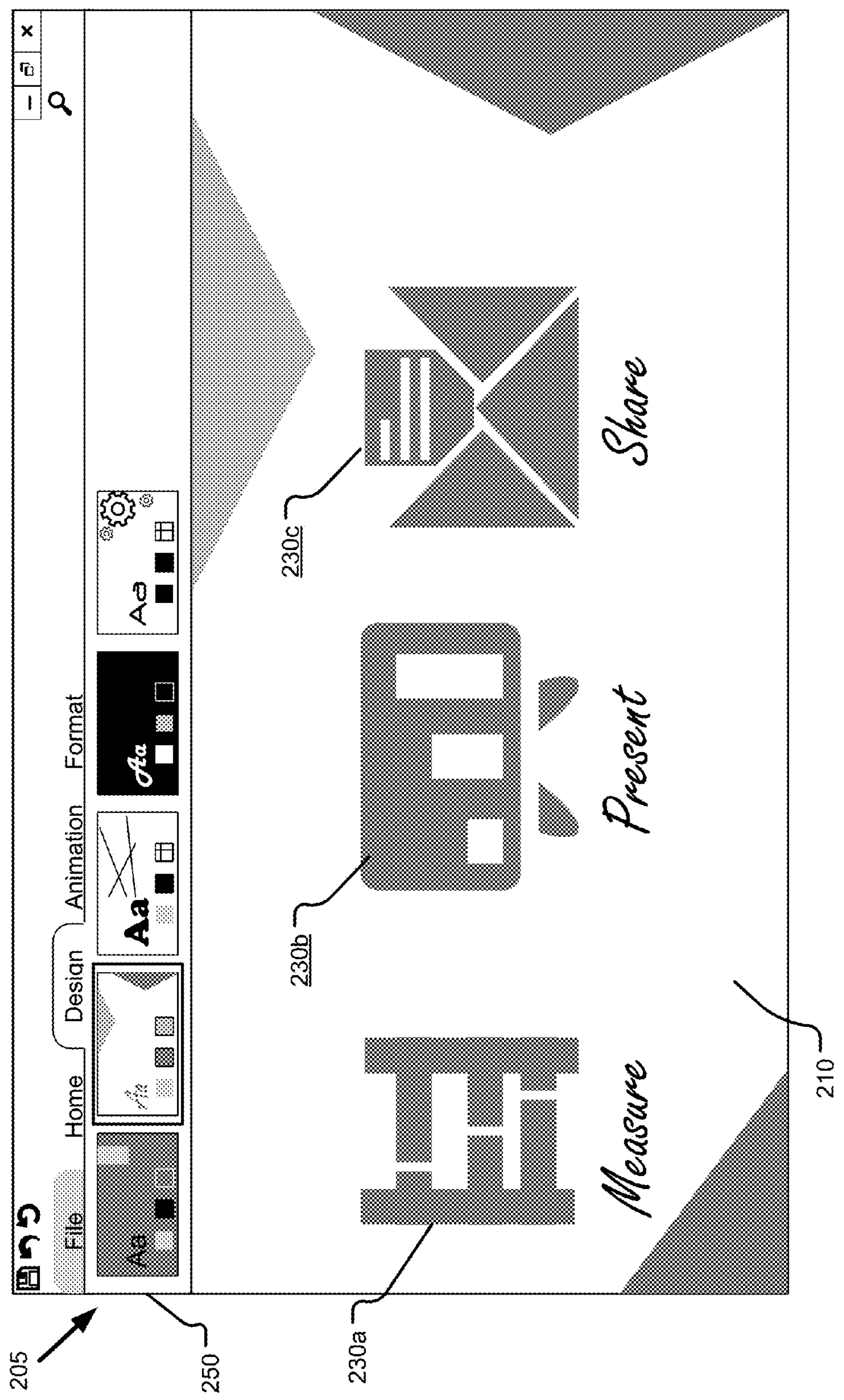

File
Home
Design
Animation
Format
Aa
Aa
Aa
Aa
Measure
Present
Share
205
250
230a
230b
230c
210

FIG. 2E

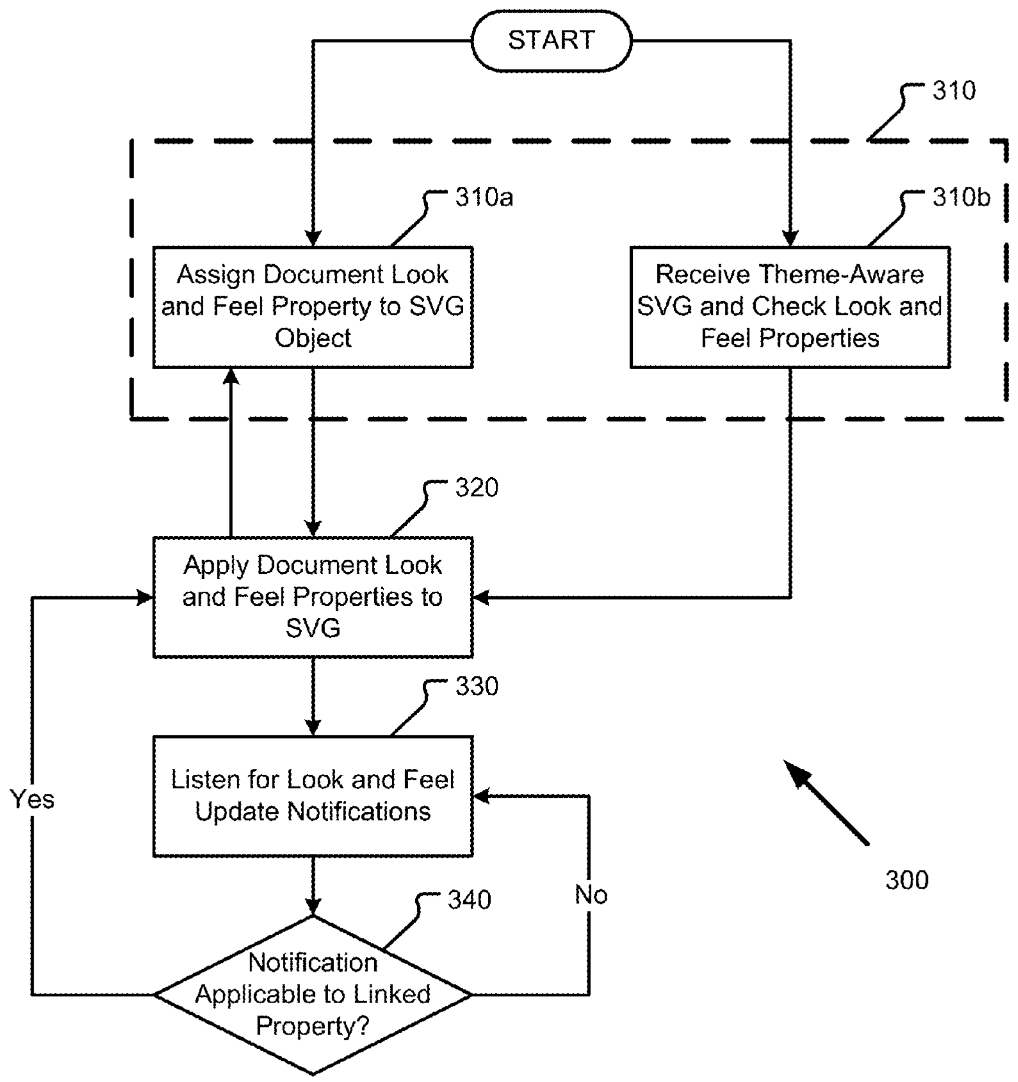

START
310
310a
310b
Assign Document Look and Feel Property to SVG Object
Receive Theme-Aware SVG and Check Look and Feel Properties
320
Apply Document Look and Feel Properties to SVG
330
Listen for Look and Feel Update Notifications
Yes
No
340
Notification Applicable to Linked Property?
300

FIG. 3

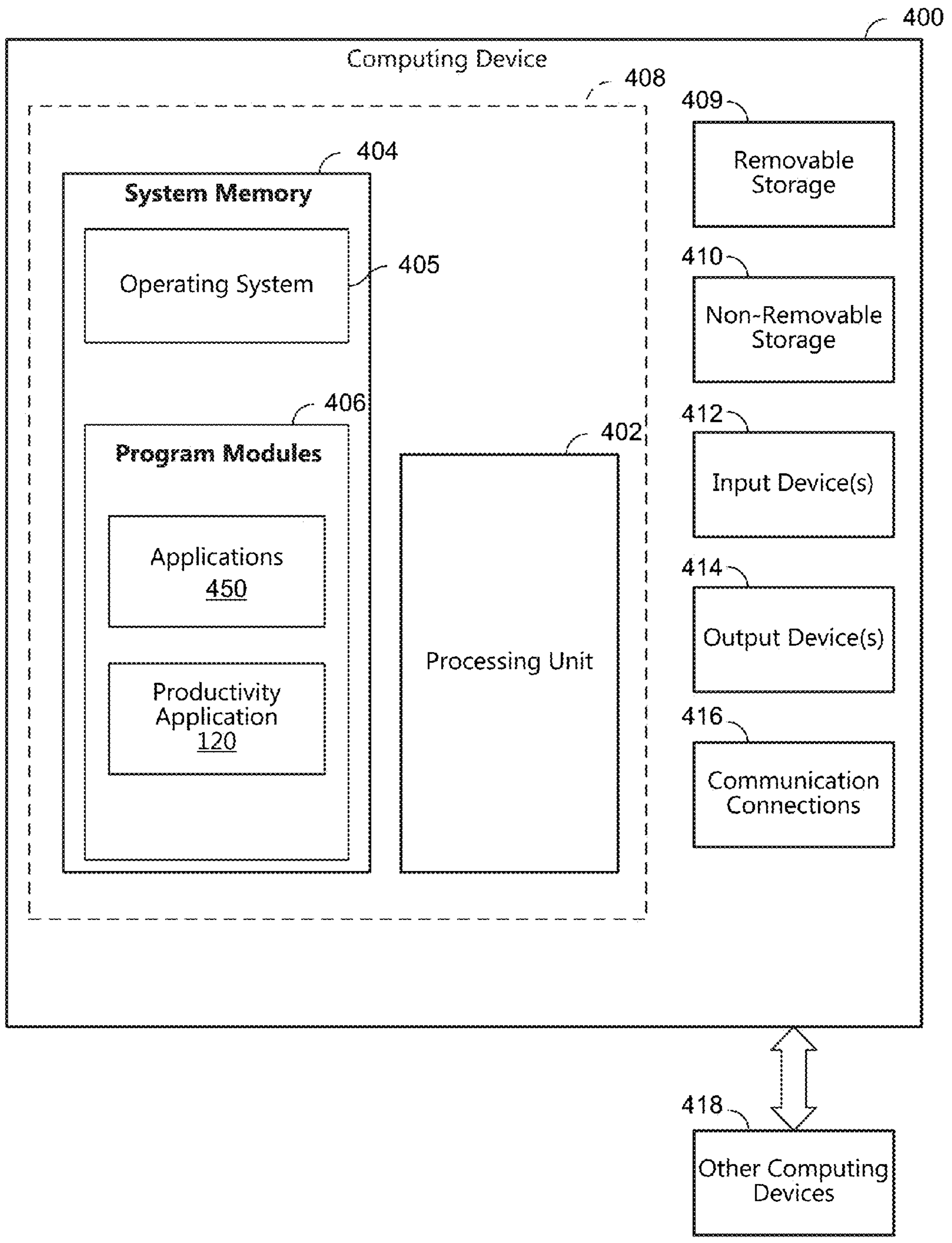
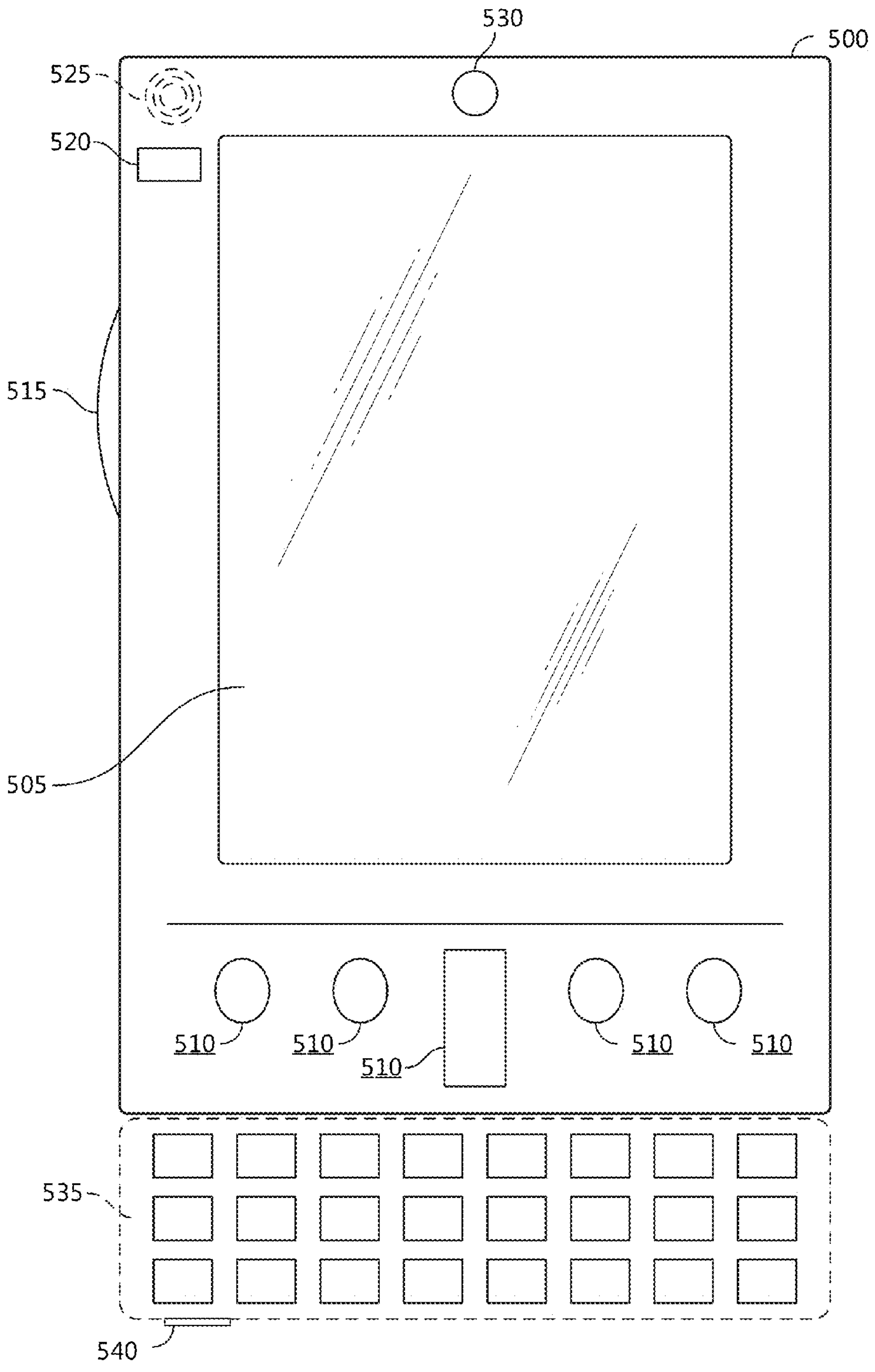

400
Computing Device
408
404
System Memory
Operating System
405
406
Program Modules
Applications 450
Productivity Application 120
402
Processing Unit
409
Removable Storage
410
Non-Removable Storage
412
Input Device(s)
414
Output Device(s)
416
Communication Connections
418
Other Computing Devices

FIG. 4



MOBILE COMPUTING DEVICE

FIG. 5A

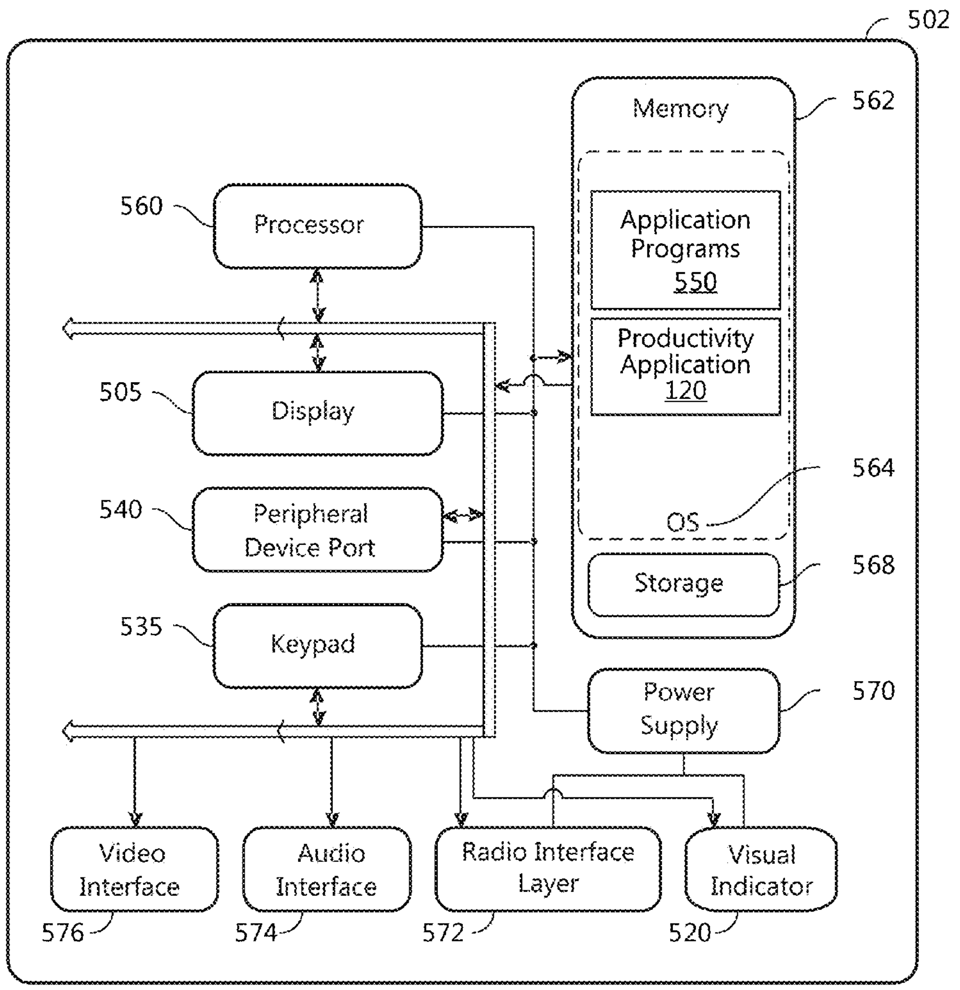

502
Memory
562
560
Processor
Application Programs 550
Productivity Application 120
505
Display
564
540
Peripheral Device Port
OS
568
Storage
535
Keypad
Power Supply
570
Video Interface
Audio Interface
Radio Interface Layer
Visual Indicator
576
574
572
520

FIG. 5B

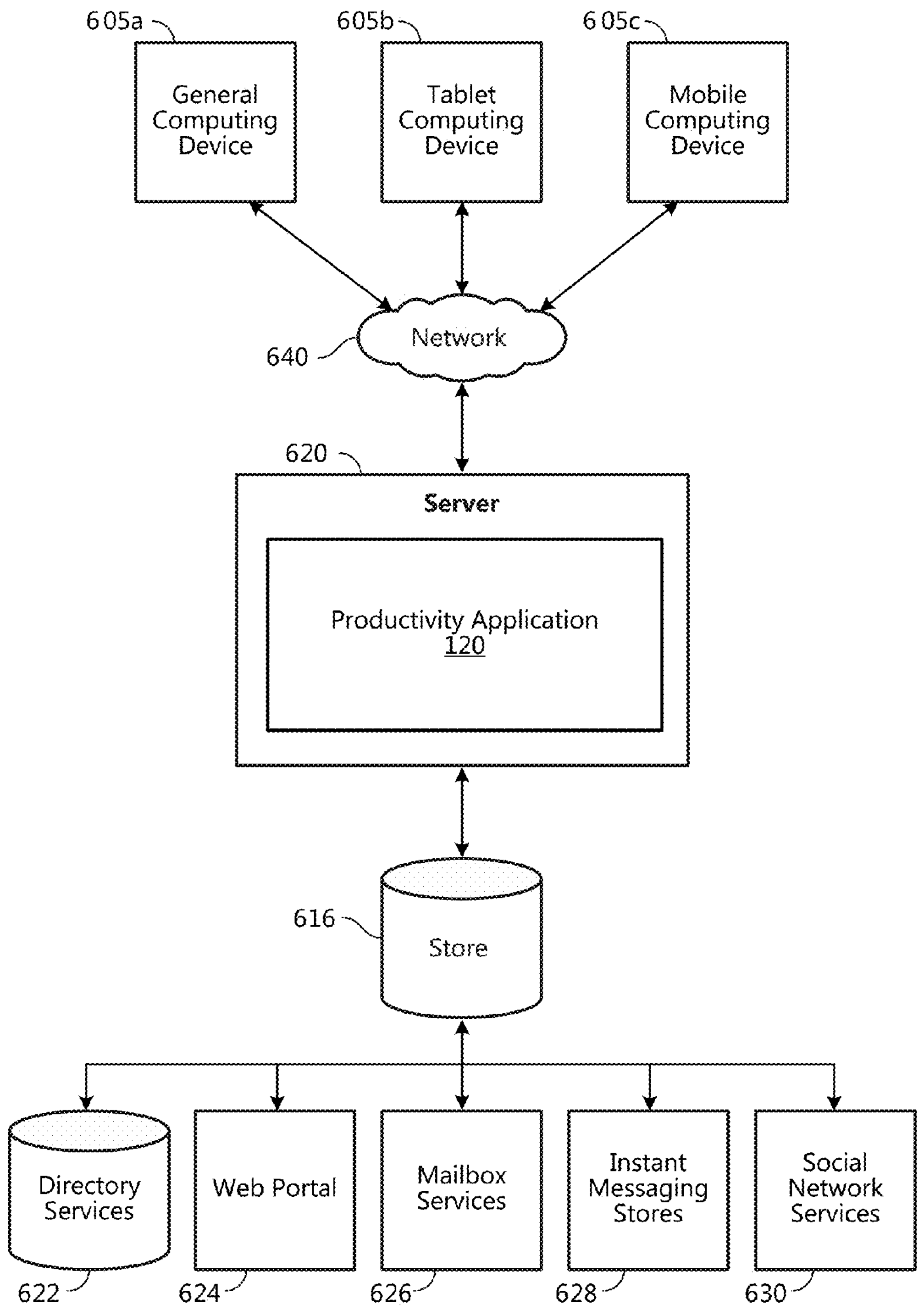

605a
General Computing Device
605b
Tablet Computing Device
605c
Mobile Computing Device
640
Network
620
Server
Productivity Application 120
616
Store
Directory Services
622
Web Portal
624
Mailbox Services
626
Instant Messaging Stores
628
Social Network Services
630

FIG. 6

# DYNAMICALLY FORMATTING SCALABLE VECTOR GRAPHICS

## CROSS-REFERENCES TO RELATED APPLICATIONS

The present application claims benefit to U.S. Provisional Application No.: 62/320,989 filed on 11 Apr. 2016, titled "DYNAMICALLY FORMATTING SCALABLE VECTOR GRAPHICS," which is incorporated herein by reference.

## BACKGROUND

Scalable Vector Graphics (SVG) is a computer graphics image format built as Extensible Markup Language (XML) objects according to the W3C SVG standard developed by the World Wide Web Consortium (W3C). As vector graphics, SVGs are composed of a fixed set of shapes that can be adjusted as the size of the SVG is adjusted, whereas raster graphics are composed of a fixed set of pixels, which can lead to artifacting or pixilation if the size of a raster graphic is adjusted. In some aspects, SVGs may include raster graphics, text, as well as properties defining specific colors, patterns, and metadata for the vector definitions (also referred to as primitives).

## SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description section. This summary is not intended to identify all features of the claimed subject matter, nor is it intended as limiting the scope of the claimed subject matter.

Systems and methods are provided herein for enabling a productivity application that operates on an SVG object to dynamically format that SVG object in accord with update notifications within the productivity application. Productivity applications (such as word processors, presentation applications, note taking applications, spreadsheet applications, etc.) may embed or link SVG objects into their document types and thereby apply "look and feel" settings for the document to the SVG object so that as the look and feel settings for the document are updated, the SVG object will incorporate those settings automatically.

Look and feel settings are variously referred to as a "theme," "style," or "design" settings (among other names), and may be referred to collectively within the present disclosure by any of these names. Look and feel settings include settings that affect the visual settings associated with objects across the document (e.g., colors, gradients, effects, shadows, line thickness, transparency, fonts, transitions, formatting, element arrangements). For example, when a "financial" theme is applied to a spreadsheet document, all of the text for positive numbers may be shown in black and negative numbers may be shown in red without the need for a user to manually update each text object's color properties. Allowing for the en masse changing of look and feel settings provides users with an improved user experience (UX) that requires fewer interactions to accomplish a style change across a document or a portion thereof. Additionally, because the computer is required to process fewer user requests when dealing with en masse changes, the fact that SVG objects require fewer memory resources to store than raster images, and the fact that SVG objects can be scaled for display on multiple devices of different display sizes without artifacting or pixilation when resizing, the efficiency of the computer itself is improved when dynamic formatting for SVGs based on update notifications in a parent application is enabled.

SVG objects, as defined by the W3C SVG standard, do not natively support dynamically updating look and feel settings in response to a change in look and feel settings in a parent application. The present disclosure, however, teaches how an SVG object may be made theme-aware and still comply with the W3C SVG standard so that it is portable between files and applications that apply the present disclosure and those that do not. By enabling the dynamic updating of SVG objects, as discussed herein, the benefits to UX and computer efficiency can be realized by documents that include SVG objects without deviating from the W3C SVG standard.

The details of one or more aspects are set forth in the accompanying drawings and description below. Other features and advantages will be apparent from a reading of the following detailed description and a review of the associated drawings. It is to be understood that the following detailed description is explanatory only and is not restrictive; the proper scope of the present disclosure is set by the claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate various aspects of the present disclosure. In the drawings:

FIG. **1**A illustrates an example environment in which SVGs may be dynamically updated based on update notifications within a parent application;

FIG. **1**B illustrates example components of a theme-awareness enabler, to enable SVG objects to be made theme-aware within a parent application;

FIGS. **2**A-E illustrate a series of actions taken in sequence that affect a canvas of a document that includes an SVG object and is governed by a theme;

FIG. **3** is a flowchart showing general stages involved in an example method for enabling theme-awareness in SVGs such that the SVGs may be dynamically updated based on update notifications within a parent application;

FIG. **4** is a block diagram illustrating physical components of a computing device with which examples may be practiced;

FIGS. **5**A and **5**B are block diagrams of a mobile computing device with which aspects may be practiced; and

FIG. **6** is a block diagram of a distributed computing system in which aspects may be practiced.

## DETAILED DESCRIPTION

The following detailed description refers to the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the following description to refer to the same or similar elements. While aspects of the present disclosure may be described, modifications, adaptations, and other implementations are possible. For example, substitutions, additions, or modifications may be made to the elements illustrated in the drawings, and the methods described herein may be modified by substituting, reordering, or adding stages to the disclosed methods. Accordingly, the following detailed description does not limit the present disclosure, but instead, the proper scope of the present disclosure is defined by the appended claims. Examples may take the form of a hardware implementation, or an entirely software implementation, or an implementation combining software and hardware aspects. The following detailed description is, therefore, not to be taken in a limiting sense.

Scalable Vector Graphics (SVG) objects, as defined by the W3C SVG standard, do not natively support dynamically updating look and feel settings in response to a change in look and feel settings in a parent application. The present disclosure, however, teaches how an SVG object may be made theme-aware and still comply with the W3C SVG standard so that it is portable between files and applications that apply the present disclosure and those that do not. By enabling the dynamic updating of SVG objects, as discussed herein, the benefits to user experience (UX) and computer efficiency associated with the document-wide application of look and feel settings can be realized by documents that include SVG images without deviating from the W3C SVG standard.

FIG. **1**A illustrates an example environment **100** in which SVGs may be dynamically updated based on update notifications within a parent application. As illustrated, a user machine **110** runs a productivity application **120** that provides a first document **130***a* having a first theme and a second document **130***b* having a second theme (generally, documents **130**) in which an SVG object **140** may be adapted to become theme-aware.

The user machine **110** is illustrative of a multitude of computing systems including, without limitation, desktop computer systems, wired and wireless computing systems, mobile computing systems (e.g., mobile telephones, netbooks, tablet or slate type computers, notebook computers, and laptop computers), hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, and mainframe computers. In some aspects, the user machine **110** is a single hardware device, while in other aspects, the user machine **110** may make use of distributed computing resources from several hardware devices to perform its functions. The hardware of these computing systems is discussed in greater detail in regard to FIGS. **4**, **5**A, **5**B, and **6**.

In various aspects, the user machine **110** is accessed locally and/or by a network, which may include the Internet, a Local Area Network (LAN), a private distributed network for an entity (e.g., a company, a university, a government agency), a wireless ad hoc network, a Virtual Private Network (VPN) or other direct data link (e.g., Bluetooth connection, a direct wired link). As will be understood, the productivity application **120** may be accessed via the network as a remote application via a thin client operating on the user machine **110** or as a local application running on the user machine **110**.

The productivity application **120** includes applications used for authoring documents locally on a user machine **110**, collaboratively across multiple user machines **110**, or online via a server as a remote application. Examples of productivity applications **120** that may be used locally or collaboratively include, but are not limited to: the Pages® word processing program, the KeyNote® presentation program, the Numbers® spreadsheet program (all available from Apple, Inc. of Cupertino, Calif.), the Illustrator® graphic design software (available from Adobe Systems, Inc. of Seattle, Wash.), the OpenOffice™ suite of productivity tools (available from the Apache Software Foundation of Forest Hill, Md.), or the Office suite of productivity tools (available from Microsoft, Corp. of Redmond, Wash.). Examples of productivity applications **120** that may be used remotely (including collaborative remote use) include, but are not limited to: the Office 365® suite of productivity tools

(available from Microsoft, Corp.), the Google Docs™ online word processing application, the Google Sheets™ online spreadsheet application, the Google Slides™ online presentation application (all available from Alphabet, Inc., of Mountain View, Calif.) and the Prezi online presentation application (available from Prezi, Inc. of San Francisco, Calif.). Such applications may store documents **130** locally or in the cloud via cloud storage solutions, such as, for example, Google DriveI™ or OneDrive® (available from Alphabet, Inc. and Microsoft, Corp., respectively).

Via the productivity application **120** the user may embed or link to an SVG object **140** (generally referred to as inserting the SVG object **140**) so that it appears in a document **130** being authored within that productivity application **120**. For example, a user may insert an SVG object **140** (illustrated as a circle in FIG. **1**A) as part of the document **130** itself (embedding the XML defining the SVG object **140** into the XML of the document **130**) or as an instance of the SVG object **140**, linked to a master SVG object. Once the SVG object **140** has been inserted into the document **130** and made theme-aware, it will accept the properties for the look and feel settings for that document **130**, and it will accept changes in the look and feel settings as they are made to the document **130**. As illustrated, the look and feel settings for the first document **130***a* affect the display properties of the SVG object **140**, and the same SVG object **140** when inserted into the second document **130***b* adopts its look and feel settings from the second document **130***b* to appear differently than it does in the first document **130***a* by adopting the "theme" of the second document **130***b*.

As illustrated in FIG. **1**A, the look and feel settings between the two documents **130** influence the line size, line color, fill color, and fill gradient properties of the SVG object **140**, but one of ordinary skill in the art will appreciate that other visual settings for the SVG object **140** may be affected so that a theme affects more or fewer settings than shown in FIG. **1**A. Additionally, although a first document **130***a* and a second document **130***b* are illustrated in FIG. **1**A, in various aspects the first document **130***a* and the second document **130***b* may be separate documents **130** or may to two different states of the same document **130**. As will also be appreciated, although illustrated as being provided by a single productivity application **120**, in some aspects, the first document **130***a* and the second document **130***b* may be provided by different productivity applications **120** (e.g., a first word processing application and a second word processing application, a word processing application and a presentation application).

FIG. **1**B illustrates example components of a theme-awareness enabler **105**, to enable SVG objects **140** to be made theme-aware within the productivity application **120**. In various aspects, the theme-awareness enabler **105** may be a system or module that is: an integrated feature or component of the productivity application **120**, an optional plugin or modification to the productivity application **120**, or a standalone application in communication with the productivity application **120**. The theme-awareness enabler **105** includes: a listener **115**, operable to detect changes and updates of theme properties within a document **130** of the productivity application **120** or an associated style sheet; a model parser **125**, operable to parse the Document Object Models (DOM) of the document **130** and of the SVG object **140** to identify properties of the DOMs that may be affected by a theme update; and a model modifier **135**, operable to change the DOM of an SVG object **140** in response to the listener **115** detecting an update of a theme property that is shared with an SVG DOM property identified by the model parser **125**.

To enable the SVG object **140** to become theme-aware, the theme-awareness enabler **105** uses the W3C SVG standard's support for cascading style sheets (CSS) in conjunction with theme update notifications from the productivity application **120** to trigger and write back changes to the SVG object **140** to reflect the theme of a given document **130**. When an update notification is received, in response to a user transmitting a command to change themes for a document **130**, to modify the look and feel settings for the current theme, or to insert a new SVG object **140** into the document **130**, the listener **115** identifies the theme property and the SVG object **140** to the model parser **125**. The identified SVG object **140** is scanned by the model parser **125** to determine whether it contains any properties that coincide with a display setting defined in the productivity application's **120** look and feel settings.

For example, an SVG object **140** specifying a slash-like image (i.e., "/") may be defined in code as:

```
CODE 1:     <line x1="0" y1="100" x2="100" y2="0"
            stroke-width="2" stroke="black" />
```

As will be noted, the color specified for the image defined in CODE 1 is associated with the definition for "black," but the same color could be specified as a hexadecimal red/green/blue (RGB) value as #000000, or other color definition schemas may be used instead. Alternatively, the image may have its stroke width and stroke color specified in a style element and omit the drawing properties in the image definition as:

```
CODE 2:     <style type="text/css">
            line{stroke-width:2;stroke:black;}
            < /style>
            <line x1="0" y1="100" x2="100" y2="0" />
```

In various aspects, theme-awareness enabler **105** is operable to convert SVG objects **140** defined as in CODE 1 to the definitional style seen in CODE 2 for use in the document **130** or vice versa depending on a preferred mode of operation.

A CSS definition may be defined within the DOM of a document **130** or an SVG object **140**, as shown in CODE 2 or in an external CSS file referenced by a style tag (e.g., via a file path). When a look and feel property from the document **130** is applied to the SVG object **140**, CSS style elements are written to a class reference within the CSS definition the model modifier **135**. The CSS style elements are the display properties for which the SVG object **140** is to be theme-aware, and are set to the values of the look and feel properties from the document **130**. In one aspect, the model modifier **135** replaces the theme-aware display properties in the SVG DOM with the class reference, so that as the document **130** has its look and feel properties changed, the CSS file will be updated and the SVG object **140** will exhibit theme-awareness. In another aspect, the model modifier **135** adds the class reference after the affected display properties to preserve the original display properties in the SVG DOM for use in programs that do not support theme-awareness. For example, if the look and feel properties for

stroke-width and color are set in the DOM or CSS of the document **130**, they may appear in code along with the SVG DOM as:

```
CODE 3: <style type="text/css">
        .AppThemeStroke{stroke-width:2;stroke:black;}
        </style>
        <line class="AppThemeStroke" x1="0" y1="100" x2="100"
        y2="0" />
```

By applying and referencing the look and feel properties as a class reference to the supported CSS functionality of an SVG object **140**, the properties will be applied to each element in the SVG object **140**, and the SVG object **140** will be made theme-aware in programs that support theme-awareness and will remain compatible with programs that do not support theme-awareness. Multiple SVG objects **140** may reference a single CSS file via class references so that a single CSS file may be updated in response to look and feel setting changes in the document **130** to affect multiple objects in that document without the need to write to the DOMs of those objects.

In a productivity application **120** that supports theme-awareness, a listener 115 checks for notifications of events that change the look and feel properties of the document **130** that will affect the theme-aware SVG object **140**, such as, for example, a user changing a "theme" of the document **130**, adjusting the look and feel properties comprising a "theme," or inserting the theme-aware SVG object **140** into a new document **130**, which may have different look and feel properties. The listener **115** may listen for changes that affect the entire document **130**, and all SVG objects **140** therein, or may listen for a selection even from the productivity application **120** that selects a given SVG object **140**. The SVG object **140** has its DOM parsed by the model parser **125** to check whether it contains properties linked with any affected look and feel properties and, if it does, those properties have their values updated in the style settings region of the DOM by the model modifier **135**. For example, if a user changes the look and feel properties of a document **130** so that the properties for stroke-width change from a value of "2" to "5" and a stroke-linecap property from "butt" to "round," the code shown in CODE 3 may be adjust to that shown in CODE 4:

```
CODE 4: <style type="text/css">
        .AppThemeStroke{stroke-width:5;stroke:black;}
        </style>
        <line class="AppThemeStroke" x1="0" y1="100" x2="100"
        y2="0" />
```

Because the SVG object **140** defined in CODE 3 specifies a class reference (AppThemeStroke) that indicates a stroke-width property as being linked to the document theme, a change in the look and feel of stroke widths for the document **130** will affect the definition in the style region CSS of the theme-aware SVG object's **140** DOM and the display of the SVG object **140** in the document **130**. Similarly, because the SVG object **140** defined in CODE 3 did not specify a stroke-linecap property via its CSS definition as linked to the document theme, a change in the look and feel of linecaps for the document **130** will not affect the definitions in the style region of the theme-aware SVG's **140** DOM or the display of the SVG object **140** in the document **130**. As will be understood, although the property for stroke color is linked between the SVG object **140** and the document **130**, because the listener **115** did not detect a change to the stroke color properties from the look and feel properties for the document **130**, the callout in the style region of the DOM for a "black" stroke will remain unaffected, and the SVG object **140** will remain displayed as black in the document **130**.

FIGS. **2**A-E illustrate a series of actions **201**-**205** taken in sequence that affect a canvas **210** of a document **130** that includes an SVG object **140** and is governed by a theme **220** (not illustrated). As will be understood, a theme **220** is a collection of look and feel properties that a user may switch between to affect multiple objects, backgrounds, and layouts of a document **130**, and may be variously referred to as a "theme," "style," or "design" (among other names). A first theme **220***a* (specifying a dark background, a set of rectangular accent objects, and a first set of theme colors) is active in FIGS. **2**A-D and a second theme **220***b* (specifying a light background, a series of overlaid triangular accent objects, and a second set of theme colors) is active in FIG. **2**E. FIGS. **2**D and **2**E illustrate various theme previews as graphical user interface (GUI) elements **250** that a user may select from to change the look and feel of the document **130**.

As illustrated in FIG. **2**A, the canvas **210** initially includes three objects: a first theme-aware object **230***a,* a second theme-aware object **230***b* (generally, theme-aware objects **230**), and a theme-unaware object **240**. Throughout the actions **201**-**205**, the theme-unaware object **240** will be converted into a third theme-aware object **230***c.* As discussed herein, the theme-unaware object **240** is an SVG object **140** whose display properties in the canvas **210** do not change when the theme **220** is changed, whereas theme-aware objects **230** will have their display properties changed when the theme **220** changes. In various aspects, the first and second theme-aware objects **230***a,* **230***b* may be SVG objects **140** that have previously been made theme-aware, or they may be another type of object (e.g., a raster graphic or a vector graphic defined by a different standard).

FIG. **2**A illustrates a first action **201**, where a user is selecting the theme-unaware object **240** in the canvas **210** for manipulation. Moving from FIG. **2**A to FIG. **2**B, second action **202** illustrates the user accessing a GUI element **250** in the document **130** to apply a theme property for a fill color to the theme-unaware object **240**. As will be appreciated, a GUI element **250** is just one example of how a theme property may be applied to a theme-unaware object **240**; dialog boxes with graphical or textual controls to assign theme properties to a theme-unaware objects **240** or portions thereof are also possible. As will also be appreciated, fill color is just one example of a display property for an object that may be applied and linked to a theme. Other examples of display properties that may be linked from a theme to an object include, but are not limited to: outline color, outline weight (i.e., line thickness), outline style (e.g., solid, dashed, striped), fill gradient, fill pattern, primary/secondary/tertiary/etc. fill color, shadow properties (e.g., offset, color, pattern, opacity), opacity, filters, and font properties (e.g., typeface, size, color, styles/effects and properties thereof).

In response to selecting a theme fill color from the GUI element **250**, such as is illustrated in FIG. **2**B, the productivity application **120** providing the document **130** performs third action **203** to write the theme elements that were selected by the user to the SVG object **140** as CSS styles, transforming the theme-unaware object **240** into a theme-aware object **230**. Alternatively, if the user selected a non-theme property, the productivity application **120** will instead change that property in the SVG object **140**, leaving it a theme-unaware object **240**. As will be appreciated, a theme-aware object **230** may be made variously more or less

theme-aware as more or fewer look and feel properties are linked with a theme-aware object **230**, respectively. FIG. **2**C illustrates the outcome of third action **203**, in which the SVG object **140** has been converted from the theme-unaware object **240** into the third theme-aware object **230***c* and now displays the theme color as its fill color.

FIG. **2**D illustrates fourth action **204**, in which a user selects a different theme **220** from the currently applied first theme **220***a* to be applied to the document **130** from a GUI element **250** showing various previews of themes **220**.

FIG. **2**E illustrates the fifth action **205**, in which the second theme **220***b* is applied to the document **130**, modifying the canvas **210** and the theme-aware objects **230** in the canvas **210**. As illustrated, each of the theme-aware objects **230** have their fill color linked to a theme color so that as the theme **220** changes from the first theme **220***a* to the second theme **220***b* (each with different look and feel properties defined for a thematic fill color for objects), the fill color of the theme-aware objects **230** will retain the link to the thematic fill color, but will be displayed in the canvas **210** as the current theme's **220** fill color. For example, if the first theme **220***a* defines a thematic fill color of red, the second theme defines a thematic fill color of blue, and the theme-aware objects **230** have the thematic fill color written as a CSS style to the SVG object **140**, then as the user switches between the two themes **220**, the theme-aware objects **230** will change between red and blue.

When a theme-aware object **230** that is an SVG object **140** is moved from the document **130** to a document **130** that does not support theme-awareness for SVG objects **140** or the document **130** is opened by a productivity application **120** that does not support theme-awareness for SVG objects **140**, the last known properties for the SVG object **140** are retained by the SVG object **140** in its new location. For example, when a theme-aware SVG object displays a thematic fill color of red in a document **130** that supports theme-awareness and is moved to a document **130** that does not, it will be displayed as red because the property defining the fill color as red has been written to the SVG object **140** and any theme-awareness that is not supported in the new document **130** can be ignored by the associated productivity application **120** without breaking support for the W3C SVG standard.

FIG. **3** is a flowchart showing general stages involved in an example method **300** for enabling theme-awareness in SVGs such that the SVGs may be dynamically updated based on update notifications within a parent application. Method **300** begins at OPERATION **310**, where a theme-aware SVG object **140** is added to a document **130**. In various aspects, adding a theme-aware SVG object **140** to a document **130** may be done by making a theme-unaware SVG object **140** theme-aware, as in SUB-OPERATION **310***a,* or by receiving an already theme-aware SVG object **140** from another document **130** or referencing a file for the theme-aware SVG object **140**, as in SUB-OPERATION **310***b.*

At SUB-OPERATION **310***a* a document look and feel property is assigned to an SVG object **140** by a user or a system to make it theme-aware (or more theme aware). A property from the document's look and feel properties may be manually selected by a user to link to a property of an SVG object **140**, or a system may automatically match properties of an SVG object **140** to look and feel properties for a document **130** based on a probabilistic analysis of the document **130** and the SVG object **140** to match properties that are likely to be linked. For example, the system may automatically determine which primitives of an SVG object

**140** define the largest area having a given fill color, and automatically link a "fillcolor**1**" look and feel property from the document **130** to those primitives and automatically link a "fillcolor**2**" or "accentcolor" look and feel property from the document **130** to the primitives that define the second largest area having a given color. Alternatively, a user may manually link desired properties of an SVG object **140** to desired look and feel properties of a document **130** via a GUI (and example of which is illustrated in FIGS. **2**A-E) or a textual dialog.

As described herein, properties may be linked, making an SVG object **140** theme-aware, by defining a class tag in the CSS region of an SVG DOM and including the class tag in the definition of affected primitives comprising the SVG object **140**. For example line, polyline, rectangle, circle, ellipse, polygon, and path primitives comprising the SVG object **140** and having a stroke-width property (i.e., a border or line thickness) may be linked to a look and feel property in a document **130** for stroke-width by defining a class tag in the SVG DOM that is interpretable by the listener of a productivity application **120** as related to a look and feel property for the stroke width in the document **130**. The class tag is then added to the definitions of the primitives that will be made theme aware. In some aspects, the original properties defined within the primitives are replaced by the class tag, while in other aspects those properties and associated values are retained in the definitions, albeit earlier in the parsing order of the definition, so as not to override the values set and linked from the look and feel settings of the document **130** via the class tag.

At SUB-OPERATION **310***b* an SVG object **140** that is already theme-aware is added to the document **130** and its properties are checked for links to document look and feel properties. In various aspects, the theme-aware SVG object **140** may be received from a different document **130**, having different values for look and feel properties than the current document **130**, or it may be retrieved from a standalone file (e.g., a stencil definition).

Proceeding from OPERATION **310** to OPERATION **320**, method **300** applies the look and feel properties of the document **130** to the linked properties of the SVG object **140**. At OPERATION **320**, the values in the class tag are updated to match those in the document for the linked look and feel properties. As will be appreciated, method **300** may return to SUB-OPERATION **310***a* from OPERATION **320** to enable a user to link additional properties between the SVG object **140** and the document **130** from those initially received from OPERATION **310** as well as reassigning links or decoupling links between properties via a GUI or textual dialog.

Proceeding from OPERATION **320** to OPERATION **330**, notifications of look and feel property changes are listened for in the productivity application **120**. When a change notification is detected, it is determined at DECISION **340** whether the property changed is referenced in the SVG object **140**. If the look and feel property that changed is referenced in the SVG object **140**, method **300** returns to OPERATION **320**, where the class definition in the DOM of the SVG object **140** is changed to reflect the new value or values for the look and feel properties of the document **130**. Otherwise, method **300** returns to OPERATION **330** to continue listening for change notifications.

While implementations have been described in the general context of program modules that execute in conjunction with an application program that runs on an operating system on a computer, those skilled in the art will recognize that aspects may also be implemented in combination with other program modules. Generally, program modules include routines, programs, components, data structures, and other types of structures that perform particular tasks or implement particular abstract data types.

The aspects and functionalities described herein may operate via a multitude of computing systems including, without limitation, desktop computer systems, wired and wireless computing systems, mobile computing systems (e.g., mobile telephones, netbooks, tablet or slate type computers, notebook computers, and laptop computers), handheld devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, and mainframe computers.

In addition, according to an aspect, the aspects and functionalities described herein operate over distributed systems (e.g., cloud-based computing systems), where application functionality, memory, data storage and retrieval and various processing functions are operated remotely from each other over a distributed computing network, such as the Internet or an intranet. According to an aspect, user interfaces and information of various types are displayed via on-board computing device displays or via remote display units associated with one or more computing devices. For example, user interfaces and information of various types are displayed and interacted with on a wall surface onto which user interfaces and information of various types are projected. Interaction with the multitude of computing systems with which implementations are practiced include, keystroke entry, touch screen entry, voice or other audio entry, gesture entry where an associated computing device is equipped with detection (e.g., camera) functionality for capturing and interpreting user gestures for controlling the functionality of the computing device, and the like.

FIGS. **4**-**6** and the associated descriptions provide a discussion of a variety of operating environments in which examples are practiced. However, the devices and systems illustrated and discussed with respect to FIGS. **4**-**6** are for purposes of example and illustration and are not limiting of a vast number of computing device configurations that are utilized for practicing aspects, described herein.

FIG. **4** is a block diagram illustrating physical components (i.e., hardware) of a computing device **400** with which examples of the present disclosure may be practiced. In a basic configuration, the computing device **400** includes at least one processing unit **402** and a system memory **404**. According to an aspect, depending on the configuration and type of computing device, the system memory **404** comprises, but is not limited to, volatile storage (e.g., random access memory), non-volatile storage (e.g., read-only memory), flash memory, or any combination of such memories. According to an aspect, the system memory **404** includes an operating system **405** and one or more program modules **406** suitable for running software applications **450**. According to an aspect, the system memory **404** includes a productivity application **120**, operable to enable a software application **450** to employ the teachings of the present disclosure via stored instructions. The operating system **405**, for example, is suitable for controlling the operation of the computing device **400**. Furthermore, aspects are practiced in conjunction with a graphics library, other operating systems, or any other application program, and is not limited to any particular application or system. This basic configuration is illustrated in FIG. **4** by those components within a dashed line **408**. According to an aspect, the computing device **400** has additional features or functionality. For example, according to an aspect, the computing device **400** includes additional data storage devices (removable and/or non-removable) such as, for example, magnetic disks, optical disks, or tape. Such additional storage is illustrated in FIG. **4** by a removable storage device **409** and a non-removable storage device **410**.

As stated above, according to an aspect, a number of program modules and data files are stored in the system memory **404**. While executing on the processing unit **402**, the program modules **406** (e.g., productivity application **120**) perform processes including, but not limited to, one or more of the stages of the method **300** illustrated in FIG. **3**. According to an aspect, other program modules are used in accordance with examples and include applications such as electronic mail and contacts applications, word processing applications, spreadsheet applications, database applications, slide presentation applications, drawing or computer-aided application programs, etc.

According to an aspect, the computing device **400** has one or more input device(s) **412** such as a keyboard, a mouse, a pen, a sound input device, a touch input device, etc. The output device(s) **414** such as a display, speakers, a printer, etc. are also included according to an aspect. The aforementioned devices are examples and others may be used. According to an aspect, the computing device **400** includes one or more communication connections **416** allowing communications with other computing devices **418**. Examples of suitable communication connections **416** include, but are not limited to, radio frequency (RF) transmitter, receiver, and/or transceiver circuitry; universal serial bus (USB), parallel, and/or serial ports.

The term computer readable media, as used herein, includes computer storage media apparatuses and articles of manufacture. Computer storage media include volatile and nonvolatile, removable and non-removable media implemented in any method or technology for storage of information, such as computer readable instructions, data structures, or program modules. The system memory **404**, the removable storage device **409**, and the non-removable storage device **410** are all computer storage media examples (i.e., memory storage). According to an aspect, computer storage media include RAM, ROM, electrically erasable programmable read-only memory (EEPROM), flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other article of manufacture which can be used to store information and which can be accessed by the computing device **400**. According to an aspect, any such computer storage media is part of the computing device **400**. Computer storage media do not include a carrier wave or other propagated data signal.

According to an aspect, communication media are embodied by computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and include any information delivery media. According to an aspect, the term "modulated data signal" describes a signal that has one or more characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared, and other wireless media.

FIGS. **5**A and **5**B illustrate a mobile computing device **500**, for example, a mobile telephone, a smart phone, a tablet personal computer, a laptop computer, and the like, with which aspects may be practiced. With reference to FIG. **5**A, an example of a mobile computing device **500** for implementing the aspects is illustrated. In a basic configuration, the mobile computing device **500** is a handheld computer having both input elements and output elements. The mobile computing device **500** typically includes a display **505** and one or more input buttons **510** that allow the user to enter information into the mobile computing device **500**. According to an aspect, the display **505** of the mobile computing device **500** functions as an input device (e.g., a touch screen display). If included, an optional side input element **515** allows further user input. According to an aspect, the side input element **515** is a rotary switch, a button, or any other type of manual input element. In alternative examples, mobile computing device **500** incorporates more or fewer input elements. For example, the display **505** may not be a touch screen in some examples. In alternative examples, the mobile computing device **500** is a portable phone system, such as a cellular phone. According to an aspect, the mobile computing device **500** includes an optional keypad **535**. According to an aspect, the optional keypad **535** is a physical keypad. According to another aspect, the optional keypad **535** is a "soft" keypad generated on the touch screen display. In various aspects, the output elements include the display **505** for showing a graphical user interface (GUI), a visual indicator **520** (e.g., a light emitting diode), and/or an audio transducer **525** (e.g., a speaker). In some examples, the mobile computing device **500** incorporates a vibration transducer for providing the user with tactile feedback. In yet another example, the mobile computing device **500** incorporates a peripheral device port **540**, such as an audio input (e.g., a microphone jack), an audio output (e.g., a headphone jack), and a video output (e.g., a HDMI port) for sending signals to or receiving signals from an external device.

FIG. **5**B is a block diagram illustrating the architecture of one example of a mobile computing device. That is, the mobile computing device **500** incorporates a system (i.e., an architecture) **502** to implement some examples. In one example, the system **502** is implemented as a "smart phone" capable of running one or more applications (e.g., browser, e-mail, calendaring, contact managers, messaging clients, games, and media clients/players). In some examples, the system **502** is integrated as a computing device, such as an integrated personal digital assistant (PDA) and wireless phone.

According to an aspect, one or more application programs **550** are loaded into the memory **562** and run on or in association with the operating system **564**. Examples of the application programs include phone dialer programs, e-mail programs, personal information management (PIM) programs, word processing programs, spreadsheet programs, Internet browser programs, messaging programs, and so forth. According to an aspect, a productivity application **120** is loaded into memory **562**. The system **502** also includes a non-volatile storage area **568** within the memory **562**. The non-volatile storage area **568** is used to store persistent information that should not be lost if the system **502** is powered down. The application programs **550** may use and store information in the non-volatile storage area **568**, such as e-mail or other messages used by an e-mail application, and the like. A synchronization application (not shown) also resides on the system **502** and is programmed to interact with a corresponding synchronization application resident on a host computer to keep the information stored in the non-volatile storage area **568** synchronized with corresponding information stored at the host computer. As should be appreciated, other applications may be loaded into the memory **562** and run on the mobile computing device **500**.

According to an aspect, the system **502** has a power supply **570**, which is implemented as one or more batteries. According to an aspect, the power supply **570** further includes an external power source, such as an AC adapter or a powered docking cradle that supplements or recharges the batteries.

According to an aspect, the system **502** includes a radio **572** that performs the function of transmitting and receiving radio frequency communications. The radio **572** facilitates wireless connectivity between the system **502** and the "outside world," via a communications carrier or service provider. Transmissions to and from the radio **572** are conducted under control of the operating system **564**. In other words, communications received by the radio **572** may be disseminated to the application programs **550** via the operating system **564**, and vice versa.

According to an aspect, the visual indicator **520** is used to provide visual notifications and/or an audio interface **574** is used for producing audible notifications via the audio transducer **525**. In the illustrated example, the visual indicator **520** is a light emitting diode (LED) and the audio transducer **525** is a speaker. These devices may be directly coupled to the power supply **570** so that when activated, they remain on for a duration dictated by the notification mechanism even though the processor **560** and other components might shut down for conserving battery power. The LED may be programmed to remain on indefinitely until the user takes action to indicate the powered-on status of the device. The audio interface **574** is used to provide audible signals to and receive audible signals from the user. For example, in addition to being coupled to the audio transducer **525**, the audio interface **574** may also be coupled to a microphone to receive audible input, such as to facilitate a telephone conversation. According to an aspect, the system **502** further includes a video interface **576** that enables an operation of an on-board camera **530** to record still images, video stream, and the like.

According to an aspect, a mobile computing device **500** implementing the system **502** has additional features or functionality. For example, the mobile computing device **500** includes additional data storage devices (removable and/or non-removable) such as, magnetic disks, optical disks, or tape. Such additional storage is illustrated in FIG. 5B by the non-volatile storage area **568**.

According to an aspect, data/information generated or captured by the mobile computing device **500** and stored via the system **502** are stored locally on the mobile computing device **500**, as described above. According to another aspect, the data are stored on any number of storage media that are accessible by the device via the radio **572** or via a wired connection between the mobile computing device **500** and a separate computing device associated with the mobile computing device **500**, for example, a server computer in a distributed computing network, such as the Internet. As should be appreciated, such data/information are accessible via the mobile computing device **500** via the radio **572** or via a distributed computing network. Similarly, according to an aspect, such data/information are readily transferred between computing devices for storage and use according to well-known data/information transfer and storage means, including electronic mail and collaborative data/information sharing systems.

FIG. **6** illustrates one example of the architecture of a system for automatic presentation of blocks of repeated content as described above. Content developed, interacted with, or edited in association with the productivity application **120** is enabled to be stored in different communication channels or other storage types. For example, various documents may be stored using a directory service **622**, a web portal **624**, a mailbox service **626**, an instant messaging store **628**, or a social networking site **630**. The productivity application **120** is operative to use any of these types of systems or the like for distribution of selected content, as described herein. According to an aspect, a server **620** provides the productivity application **120** to clients **605***a-c* (generally clients **605**), which may be run user machines **110**. As one example, the server **620** is a web server providing productivity application **120** over the web. The server **620** provides productivity application **120** over the web to clients **605** through a network **640**. By way of example, the client computing device is implemented and embodied in a personal computer **605***a*, a tablet computing device **605***b* or a mobile computing device **605***c* (e.g., a smart phone), or other computing device. Any of these examples of the client computing device are operable to obtain content from the store **616**.

Implementations, for example, are described above with reference to block diagrams and/or operational illustrations of methods, systems, and computer program products according to aspects. The functions/acts noted in the blocks may occur out of the order as shown in any flowchart. For example, two blocks shown in succession may in fact be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending upon the functionality/acts involved.

The description and illustration of one or more examples provided in this application are not intended to limit or restrict the scope as claimed in any way. The aspects, examples, and details provided in this application are considered sufficient to convey possession and enable others to make and use the best mode. Implementations should not be construed as being limited to any aspect, example, or detail provided in this application. Regardless of whether shown and described in combination or separately, the various features (both structural and methodological) are intended to be selectively included or omitted to produce an example with a particular set of features. Having been provided with the description and illustration of the present application, one skilled in the art may envision variations, modifications, and alternate examples falling within the spirit of the broader aspects of the general inventive concept embodied in this application that do not depart from the broader scope of the present disclosure.

We claim:

**1**. A method for dynamically formatting scalable vector graphic (SVG) objects based on update notifications of look and feel setting changes in a parent application, comprising:

adding, by a computer, an SVG object to a document, the SVG object including a display property linked to a look-and-feel property of the document, wherein the look-and-feel property is related to a theme of the document, and wherein the display property is linked to the look-and-feel property by defining, in a cascading style sheet (CSS) region of a document object model (DOM) of the SVG object, a class tag that is interpretable by the document as related to the look-and-feel property;

setting, by the computer, a value of the look-and-feel property as a value for the display property of the SVG object by setting a value in the class tag equal to the value of the look-and-feel property;

listening, by the computer, for an update notification that is generated in response to a change made to the look-and-feel property within the document, the update notification including a new value of the look-and-feel property based on the change; and

updating, by the computer, the value for the display property of the SVG object to the new value of the look-and-feel property by setting the value in the class tag equal to the new value of the look-and-feel property.

**2**. The method of claim **1**, wherein adding the SVG object to the document further comprises:

receiving, by the computer, a SVG object in the document, wherein the SVG object does not include the display property linked to the look-and-feel property of the document;

receiving, by the computer, a selection of a desired display property of the-SVG object;

receiving, by the computer, a selection of a desired look-and-feel property of the document; and

linking, by the computer, the desired display property to the desired look-and-feel property.

**3**. The method of claim **2**, wherein the selection of the desired display property and the selection of the desired look-and-feel property are received from a user.

**4**. The method of claim **2**, wherein the desired display property and the desired look-and-feel property are automatically determined by the computer based on a probabilistic analysis of the document and the SVG object.

**5**. The method of claim **2**, wherein linking the desired display property to the desired look-and-feel property further comprises:

setting, by the computer, the value in the class tag equal to the value of the desired look-and-feel property.

**6**. The method of claim **5**, further comprising:

removing, by the computer, the desired display property from a definition of a primitive of the SVG object in the DOM; and

adding, by the computer, the class tag to the definition of the primitive.

**7**. The method of claim **1**, wherein adding the SVG object to the document further comprises:

receiving, by the computer, the SVG object from a different document having a different set of look-and-feel properties.

**8**. The method of claim **1**, wherein the change made to the look-and-feel property within the document includes a user adjustment of the value of the look-and-feel property to the new value.

**9**. The method of claim **8**, wherein the user adjustment of the value of the look-and-feel property to the new value comprises selecting a new theme for the document.

**10**. The method of claim **1**, further comprising:

receiving, by the computer, a selection of a desired display property for the SVG object from a user, wherein the desired display property is linked to the look-and-feel property;

receiving, by the computer, a selection of a value for the display property that is not related to the theme of the document; and

unlinking, by the computer, the desired display property from the look-and-feel property by removing the look-and-feel property from the CSS region of the DOM of the SVG object and hardcoding the value for the display property in a primitive definition.

**11**. The method of claim **1**, further comprising:

receiving, by the computer, a selection of a desired display property for the SVG object from a user, wherein the desired display property is linked to a first look-and-feel property;

receiving, by the computer, a selection of a second look-and-feel property from the user; and

relinking, by the computer, the desired display property from the first look-and-feel property to the second look-and-feel property by removing a class tag associated with the first look-and-feel property from the CSS region of the DOM of the SVG object and inserting a class tag associated with the second look-and-feel property into the CSS region of the DOM.

**12**. A system for dynamically formatting scalable vector graphic (SVG) objects based on update notifications of look and feel setting changes in a parent application, comprising:

a processing unit; and

a system memory, including instructions, which when executed by the processing unit are operable to provide:

a listener, operable to identify a look and feel setting change made in the parent application, wherein the look and feel setting change includes adjustment of a value of a look-and-feel property of a document hosted by the parent application from a first value to a second value;

a model parser, operable to parse an SVG Document Object Model (DOM) of an SVG object in the parent application to identify a display property of the SVG object that matches the look-and-feel property of the document, wherein the first value of the look-and-feel property of the document is set as a value for the display property of the SVG object within the SVG DOM by defining a cascading style sheet (CSS) definition within the SVG DOM including a class reference, and setting the class reference for the display property to the first value of the look-and-feel property; and

a model modifier, operable to modify the SVG DOM in response to the listener identifying the look and feel setting change, wherein the modification includes an update of the value for the display property of the SVG object to the second value of the look-and-feel property, the update comprising setting the class reference for the display property to the second value of the look-and-feel property.

**13**. The system of claim **12**, wherein the listener is further operable to identify the SVG object based on receiving a selection event notification identifying the SVG object from the parent application.

**14**. The system of claim **12**, wherein the listener is further operable to identify the SVG object based on receiving an insertion event notification for inserting the SVG object into the document hosted by the parent application.

**15**. The system of claim **12**, wherein the SVG object is an instance of a master object stored by the parent application.

**16**. The system of claim **12**, wherein modifying the SVG DOM further comprises:

replacing the display property in the SVG DOM with the class reference.

**17**. The system of claim **12**, wherein an operability of the SVG object to be displayed in an application that does not support themes for SVG objects is preserved.

**18**. A computer readable storage device including instructions to enable a computer to dynamically format scalable vector graphic (SVG) objects based on update notifications of look and feel setting changes in a parent application, the instructions comprising:

receiving a SVG object in a document, the SVG object comprising a document object model (DOM) defining a plurality of display properties related to the SVG object;

receiving a selection of a desired display property from among the plurality of display properties for the SVG object;

receiving a selection of a given look-and-feel property of the document, wherein the given look-and-feel property is related to a theme for the document;

linking the desired display property to the given look-and-feel property by defining, in a cascading style sheet (CSS) region of the DOM of the SVG object, a class tag that is interpretable by the document as related to the given look-and-feel property;

setting a value of the given look-and-feel property as a value for the desired display property of the SVG object by setting a value in the class tag equal to the value of the given look-and-feel property;

listening for an update notification that is generated in response to a change made to the given look-and-feel property within the document, the update notification including a new value of the given look-and-feel property based on the change; and

updating the value for the desired display property of the SVG object to the new value of the given look-and-feel property by setting the value in the class tag equal to the new value of the given look-and-feel property.

**19**. The computer readable storage device of claim **18**, wherein the SVG object is operable to be displayed in an application that does not support themes for SVG objects, wherein the plurality of display properties determine how the application displays the SVG object.

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